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Damp Housing Conditions and Asthma in Rhode Island

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Introduction. Exposure to environmental agents can play an important role in the development and exacerbation of asthma, a condition that affects an estimated 84,000 persons in Rhode Island (RI).[1] Considering the amount of time spent indoors, housing conditions are of particular interest. More specifically, several studies in the U.S. and elsewhere have found that the prevalence of asthma and other respiratory symptoms among both children and adults are higher in homes with reported dampness or mold.[2-5] Mildew (mold in early stage) and molds are fungi that grow on organic materials almost anywhere indoors and outdoors.[6] They thrive in moist environments – mold growths or colonies can develop on damp surfaces within 24 to 48 hours – and reproduce by making small, lightweight spores that travel through the air.[6] The work presented here examines the relationship between home dampness/mildew odor and asthma in Rhode Island (RI).At the national level, Healthy People 2010 includes the following objective relevant to environmental risk factors: increase the number of "persons with asthma who receive assistance with assessing and reducing exposure to environmental risk factors in their home, school, and work environments."[7]

Methods. Data on persons reported with asthma, dampness in the home, and mildew odor in the home were obtained from the RI Health Interview Survey,[1] a periodic telephone survey of approximately 2,600 households including 6,500 individuals per iteration. Percentages and estimated populations are based on weighted data for 2001.

Prevalence of asthma is defined as persons who answered "yes" to "Does anyone in the household have asthma?" and "Did a doctor say that you/he/she have/has asthma?" Dampness in the home is determined from two questions as shown in Table 1: (a) "During the past 12 months, has there been water or dampness in the apartment/house where you live caused by broken pipes, leaks, heavy rain, or floods?" and (b) "Has this happened more than once in the past 12 months?" Mildew odor in the home is defined as persons who answered "yes" to "Does the apartment/house where you live frequently have a mildew odor or musty smell?" All data exclude respondents who answered "I don't know" or who refused to answer the question.

Results. Among all persons in RI, 18% report the presence of any dampness (9% report one time dampness; 9% report repeated dampness), 10% report mildew odor, and 23% report either any dampness or mildew odor in the home. (Figure 1) The percent of Rhode Islanders who report dampness and mildew odor in the home varies by several demographic variables. Damp housing/mildew odor was reported less often among homeowners (versus renters), Hispanics, and persons of older age. The observed relationship between demographic variables and home dampness/mildew odor was independent of gender and income.

Table 1. Definition of Groupings Based on Dampness in the Home Questions

	Questions	
Grouping	a) Dampness in house, past 12 months	b) More than one occasion
No dampness	No	NA
Any dampness	Yes	Yes or No
One-time dampness	Yes	No
Repeated dampness	Yes	Yes

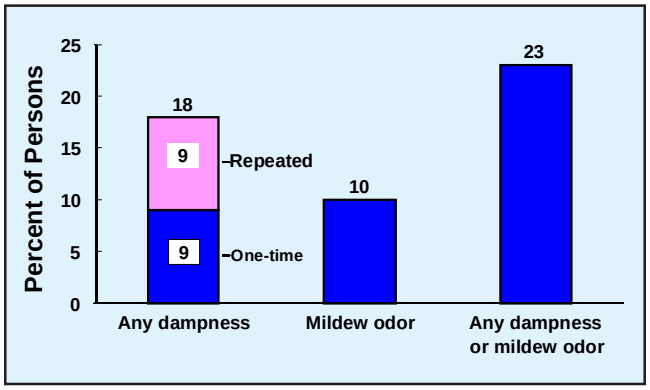

Figure 1. Prevalence of dampness and mildew odor in housing, Rhode Island, 2001.

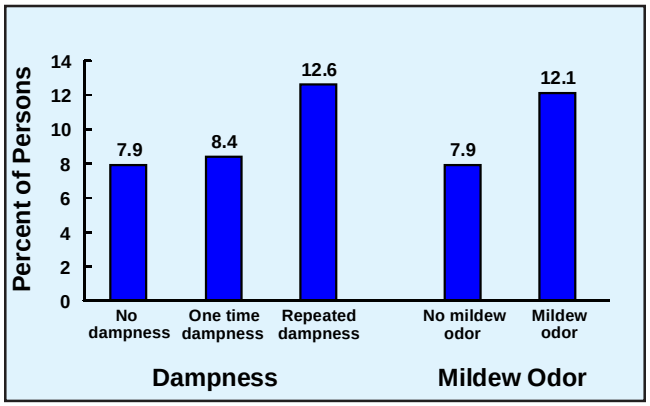

Figure 2. Prevalence of asthma, by presence of dampness and mildew odor in housing, Rhode Island, 2001.

According to this study, 8.6% of Rhode Islanders are reported to have a doctor's diagnosis of asthma. The burden of asthma varies according to dampness/mildew odor housing conditions. (Figure 2) The percent of persons in RI who have asthma is 7.9% among those with no dampness in the home, 8.4% among those with one-time dampness in the home, and 12.6% among those with repeated dampness in the home. The percent of persons in RI with asthma is 7.9% among those with no mildew odor in the home. This number jumps to 12.1% among persons who report mildew odor in the home. Odds ratios (ratio of event occurring with risk condition to event occurring without risk condition) for associations between asthma and home dampness/mildew odor range from 1.14 to 1.60. (Table 2)

Age is a significant variable when considering the relationship between asthma and home dampness/mildew odor. (Figure 3) Among persons who report no dampness or mildew odor in the

Table 2.

Housing Conditions	Odds Ratio
One time dampness	1.14
Repeated dampness	1.54
Mildew odor	1.60
Any dampness or mildew	1.42

home, the burden of asthma is distributed evenly across all age groups (about 8%) except for those 65 years and over (asthma prevalence of 5.5%). Among persons who report any dampness or mildew odor in the home, the percent with asthma decreases as age increases. The strongest association between asthma and any dampness or mildew odor is among 0-17 year-olds. In this age group, the percent of persons with asthma is 8.2% among those with no dampness or mildew odor, and 14.6% among those with any dampness or mildew odor in the home. A smaller association is seen among persons ages 18-44 (7.9% versus 10.1%). No difference is observed among persons ages 45-64 (8.3% for both no dampness/mildew odor and any dampness/mildew odor), and there is a small inverse relationship among those 65 years and over (5.5% versus 4.2%).

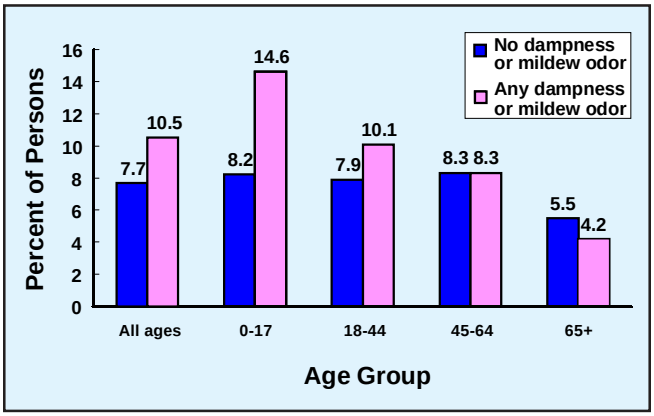

Figure 3. *Prevalence of asthma, by age group and presence of dampness and mildew odor in housing, Rhode Island, 2001.*

Discussion. Published research[2-5] has demonstrated that dampness and mildew odor in the home are potential risk factors for asthma. We have observed a similar association in RI survey data. The prevalence of asthma in RI is elevated among persons who report one time or repeated dampness or mildew odor in the home compared with those who report no dampness or mildew odor in the home. This relationship between home asthma and dampness/mildew odor was strongest among persons ages 0-17. The burden of asthma in this age group was disproportionately higher than in other age groups. Results suggest that children and young adults are more susceptible than adults to developing asthma as a result of exposure to home dampness/mildew odor.

Future investigations may want to examine other exposures in the home environment, such as environmental tobacco smoke or the presence of adequate ventilation, as well as the relationship between asthma and dampness/mildew odor in other indoor environments such as workplaces and schools.

This and future studies will be instrumental in designing public health interventions to reduce exposure to environmental triggers of asthma in order to reduce asthma morbidity. Asthmatic patients should be encouraged to deal with mold problems effectively and efficiently, and to take the following steps to prevent mold and mildew problems in their homes:[6]

- Fix leaks in pipes or other sources of water.
- Be sure the home has adequate ventilation.
- Use dehumidifiers during humid months.
- Clean bathrooms with mold killing products.

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